



Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381

September 11, 2014

10 CFR 50.73

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Watts Bar Nuclear Plant, Unit 1
Facility Operating License No. NPF-90
NRC Docket No. 50-390

Subject: **Licensee Event Report 390/2014-003, Manual Reactor Trip Due To Automatic Feedwater Isolation**

This submittal provides Licensee Event Report (LER) 390/2014-003. This LER provides details concerning a reactor trip which occurred at Watts Bar Nuclear Plant, Unit 1 on July 13, 2014. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A).

There are no regulatory commitments in this letter. Please direct any questions concerning this matter to Gordon Arent, WBN Licensing Director, at (423) 365-2004.

Respectfully,

A handwritten signature in blue ink, appearing to read "Kevin T. Walsh", is positioned above the typed name.

Kevin T. Walsh
Site Vice President
Watts Bar Nuclear Plant

Enclosure
cc: See Page 2

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Enclosure
cc (Enclosure):

NRC Regional Administrator - Region II

NRC Senior Resident Inspector - Watts Bar Nuclear Plant

NRC Project Manager – Watts Bar Nuclear Plant

**LICENSEE EVENT REPORT (LER)**(See Page 2 for required number of
digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME

Watts Bar Nuclear Plant, Unit 1

2. DOCKET NUMBER

05000390

3. PAGE

1 OF 5

4. TITLE

Manual Reactor Trip due to Automatic Feedwater Heater Isolation

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
07	13	2014	2014	003	00	09	11	2014	N/A	N/A
									N/A	N/A

9. OPERATING MODE

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

1	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
10. POWER LEVEL	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER**LICENSEE CONTACT**

Dean Baker, Senior Program Manager - Licensing

TELEPHONE NUMBER (Include Area Code)

423-452-4589

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
A	SM	RLY	GE	Y	A	SM	LIC	MASONEI LIAN	Y

14. SUPPLEMENTAL REPORT EXPECTED☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO**15. EXPECTED SUBMISSION DATE**

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On July 13, 2014 at 1937 [EDT], Watts Bar Nuclear Plant operators manually tripped the Unit 1 reactor due to automatic isolation of all low pressure feedwater heaters. Concurrent with the reactor trip, the Auxiliary Feedwater system actuated as designed.

All Control and Shutdown rods fully inserted. All safety systems responded as designed and the unit was stabilized in Mode 3, with decay heat removal via Auxiliary Feedwater, steam dumps and the main condenser, with the station in a normal shutdown electrical alignment.

The need to manually trip the reactor was determined to be the result of two separate age related failures associated with the control scheme of the #7 Heater Drain Tank (HDT). The root cause of these failures was that replacement preventative maintenance (PM) tasks did not exist for these components. The components in question were replaced and corrective actions have been developed to generate replacement PMs for both components. In addition, replacement PMs will be developed for similar critical components of the Secondary Systems based on EPRI Guidance.

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CONTINUATION SHEET**

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

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NARRATIVE**I. PLANT CONDITIONS**

At the time of the event, Watts Bar Nuclear Plant (WBN) Unit 1 was in Mode 1 at 100 percent rated thermal power (RTP).

II. DESCRIPTION OF EVENT**A. Event**

On July 13, 2014, at 1927 Eastern Daylight Time (EDT), both #7 Heater Drain Tank (HDT) pumps {EIS:P} tripped off-line due to a failed relay {EIS:RLY} associated with low level circuitry for the #7 Heater Drain Tank {EIS:TK}. Operations personnel entered the abnormal operating instruction (procedure) for heater drain malfunction, however, HDT level continued to increase because the HDT level controller {EIS:LIC} did not transmit an open demand signal to the bypass valve which would have diverted excess inventory to the condenser. The #7 HDT level continued to increase and began filling the Low Pressure Feedwater Heaters, resulting in high level isolation signals that secured the three Feedwater Heater Strings {EIS:SM}. Due to the impending loss of feedwater, operations personnel manually tripped the reactor before an automatic trip would occur on low-low steam generator level.

This event is reportable under 10 CFR 50.73(a)(2)(iv)(A).

B. Inoperable Structures, Components, or Systems that Contributed to the Event

No inoperable structures, components, or systems contributed to this event. A non-safety related relay and level controller were found to have failed, which resulted in automatic feedwater heater isolation.

C. Dates and Approximate Times of Occurrences

Date	Time (EDT)	Event
7/13/2014	1927	Both #7 Heater Drain Tank Pumps Tripped off-line
7/13/2014	1928	Operators entered procedure 1-AOI-47, Heater Drains Malfunction
7/13/2014	1935	Operators initiated downpower to 92% at 1% per minute in accordance with 1-AOI-47.
7/13/2014	1937	All three Low Pressure Feedwater Heater Strings began isolating.
7/13/2014	1937	Operators initiated a manual Unit 1 Reactor and Turbine trip.

D. Manufacturer and Model Number of Components that Failed.

Masonneilan Series 12800 Liquid Level Controller, Model Number 12811 {EIS:LIC}.
General Electric HFA 71-L7 relay, Model 12HFA51A41F {EIS:RLY}.

E. Other Systems or Secondary Functions Affected

No other systems or secondary functions were affected by this event beyond the failures identified.

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F. Method of discovery of each Component or System Failure or Procedural Error

The failures associated with the HDT control scheme were identified as a result of this event .

G. Failure Mode and Effect of Each Failed Component

There were two failures associated with this event. The first was the failure of a normally energized relay coil after more than 10 years of operation. This resulted in the trip of both HDT pumps. The second failure is attributed to age related degradation of "soft" parts associated with a level indicating controller. This failure resulted in the inability of the level indicating controller to send an adequate pneumatic signal that would result in the opening of 1-LCV-6-190B, the HDT bypass to the condenser. This second failure led to a high level isolation of the feedwater system.

H. Operator Actions

Upon receiving an annunciation that both Heater Drain Tank pumps had tripped, operators entered procedure 1-AOI-47, Heater Drains Malfunction. Based on this procedure, operators commenced a manual downpower of the unit. When the Low Pressure Feedwater heater strings began isolating on high level, operators manually tripped the reactor.

I. Automatically and Manually Initiated Safety System Responses

Upon the loss of all three Low Pressure Feedwater Heater strings, operators manually initiated a Unit 1 Reactor and turbine trip. All safety systems responded as expected.

III. CAUSE OF THE EVENT

A. The cause of each component or system failure or personnel error, if known.

The cause for both component failures is attributed to no associated preventative maintenance (PM) tasks on these components .

B. The cause(s) and circumstances for each human performance related root cause.

Watts Bar has determined that the root cause was that replacement PMs did not exist for the failed components.

IV. ANALYSIS OF THE EVENT

All plant safety systems operated as planned in response to this event.

Watts Bar Unit 1 has three separate feedwater heater strings that support plant operation. The Low pressure plant feedwater heaters numbers 4, 5, 6 and 7 (A, B, and C heater strings) drain to the common #7 Heater Drain Tank. Drains collected in the #7 HDT are pumped forward to the condensate system between the #6 and #7 feedwater heaters using two Heater Drain pumps. The design of the system includes a Net Positive Suction Head (NPSH) protection feature of the Heater Drain pumps by providing a pump trip on low level in the #7 HDT. This protective feature is provided by a limit switch (LS-6-190B) which includes a normally energized auxiliary relay in the control circuit. At the commencement of this event, the normally energized auxiliary relay (GE HFA Relay) coil failed, resulting in the trip of the Heater Drain pumps.

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With the trip of the Heater Drain pumps, level in the #7 HDT increased to the level setpoint where Level Indicating Controller (1-LIC-6-190B) should have caused bypass valve 1-LCV-6-190B to open, diverting drain flow to the condenser. This controller failed to provide an adequate opening pneumatic signal to 1-LCV-6-190B as a result of age-related degradation of a diaphragm and o-ring within the device. With the failure of 1-LCV-6-190B to open, level in the system continued to rise to the high level trip setpoint where all feedwater strings were automatically isolated. With the impending loss of normal feedwater, operations personnel manually tripped the unit prior to the receipt of an automatic reactor trip signal.

V. ASSESSMENT OF SAFETY CONSEQUENCES

- A. Availability of systems or components that could have performed the same function as the components and systems that failed during the event

The failures that resulted in this plant trip were on plant secondary systems. No redundancy to these devices is provided by the design. All safety systems operated as designed and no abnormal responses were noted. The sequence of events associated with the trip were bounded by the safety analysis assumptions.

- B. For events that occurred when the reactor was shut down, availability of systems or components needed to shutdown the reactor and maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident

Systems and components required to maintain safe shutdown conditions were available during the event.

- C. For failure that rendered a train of a safety system inoperable, an estimate of the elapsed time from the discovery of the failure until the train was returned to service

There were no failures that rendered a safety system inoperable during this event.

VI. CORRECTIVE ACTIONS

This event was entered into the TVA Corrective Action Program (CAP) and is being tracked as problem evaluation report (PER) 909612.

- A. Immediate Corrective Actions

The failed relay and level indicating controller were identified and replaced.

- B. Corrective Actions to Prevent Recurrence

A root cause analysis determined that replacement preventative maintenance (PM) work orders did not exist for the failed components. Preventative maintenance work orders will be developed for the impacted components. In addition, replacement PMs will be developed for similar critical components of the Secondary Systems based on EPRI Guidance.

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VII. ADDITIONAL INFORMATION

A. Previous similar events at the same plant

Watts Bar Unit 1 reported a manual reactor trip due to the start of feedwater heater isolation in LER 2008-002. While this event involved the failure of the #7 HDT bypass valve to condenser {EIS:LCV} to open, the cause of the valve's failure to open was different (air line to valve failed as a result of vibration induced fatigue as a result of improper installation).

B. Additional Information

Design changes have been implemented at Sequoyah and at Watts Bar Unit 2 to prevent similar single level switch vulnerabilities from tripping both HDT pumps.

C. Safety System Functional Failure Consideration

There were no safety system failures associated with this event.

D. Scrams with Complications Consideration

There were no complications during the plant response to this scram.

VIII. COMMITMENTS

None.